12

A

CHEMICAL ANALYSIS

OF THE

WATERS OF NEW LEBANON,

IN THE STATE OF NEW-YORK,

WITH OBSERVATIONS ON THEIR MEDICINAL QUALITIES, AND PRINCIPALLY AS A BATH.

BY WILLIAM MEADE, M. D.

MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY OF PHILADELPHIA; HONORARY MEMBER OF THE ROYAL PHYSICAL SOCIETY OF EDINBURGH, AND OF THE MEDICAL SOCIETY OF PHILADELPHIA, &c. &c. &c.

BURLINGTON, NEW-JERSEY,

PRINTED BY DAVID ALLINSON.

1818.

PREFACE.

The principal part of the following pages were presented to the public by the author some time ago, in the form of an appendix to his treatise on the waters of Ballston and Saratoga, he has since found, that a separate essay on the waters of New Lebanon would be highly acceptable to many invalids who visit those springs, and who feel no interest in the properties, either of the waters of Ballston or Saratoga. To accommodate such persons, and at the solicitation of the proprietor of the spring, the author has consented to come forward with a new edition in the present form, in doing so, he has had it chiefly in view, to give such information to those who visit the springs, as he has been enabled to obtain from subsequent inquiry and experience. The analytical part he has seen

no reason to alter his opinion on, but many new cases having occurred to him during the last Summer, he has been induced to enter more fully into the medicinal qualities of the spring, and to go more into the detail of its use as a bath, as well as of warm bathing in general. The whole of this chapter has therefore been revised, corrected, and greatly enlarged. While on the one hand, he has been cautious in attributing to such waters more virtues than they really possess, he hopes on the other, that he has done justice to the medicinal properties of a spring, which the most partial observer will perceive, derives its principal qualities from its purity and temperature.

Whatever may be the public opinion on this production, the author assures himself that he will, at least, obtain credit for his motives in publishing it, and will feel great satisfaction if the observations which he has made, afford useful information to those, whose health induce them to visit these springs.

ANALYSIS OF LEBANON SPRING,

STATE OF NEW-YORK.

SECTION I.

Description of Lebanon.

The village of Lebanon is situated in the state of New-York, on the direct road from Albany to Boston, and about twenty-eight miles distance from the former place. It adjoins the states of Massachusetts and Connecticut, from each of which it is not more than three miles distant. The approach to this village is through a rich and fertile country, agreeably diversified with hill and dale. The spring is situated on the south side of an eminence, and at least one hundred and fifty feet above the level of a rivulet which runs in the valley beneath, and passes through the village. From the portico of the hotel, the eye has an ex-

tensive prospect of the surrounding country, exhibiting a landscape highly interesting from the beauty of its mountain scenery, the native roughness of which is agreeably relieved by a view of the Shakers village which opens at two miles distance, and exhibits all that luxuriance of cultivation and attention to neatness and order, which characterize that industrious but singular class of people.

The soil in the neighbourhood is of a good quality and highly cultivated, particularly in the village. And wherever limestone is a predominant rock, as is here in many places the case, it is most sensibly distinguished by the luxuriance of the vegetation, and the superiority of the crops. At this side the Hudson river, as I have already remarked, the mineralogist soon perceives a transition country, the whole of the rocks in the neighbourhood of the spring being of this character ; consisting of transition limestone, transition greenstone, gray wacke, and transition slate. Those rocks, as is usually the case, and particularly the transition limestone, form high mountain masses, cliffs, and precipices. Such rocks are said generally to contain organic remains, yet this is not always the case; and though I have examined the strata of this place with great attention, I have never been able to discover any trace of animal or vegetable impressions in them. The position of the strata is always found here somewhat inclined, distinguishing it very decidedly from the flœtz or horizontal formation.

In the neighourhood of the spring in particular, the rocks which are most abundant are limestone and gray wacke ; both of them have a slaty fracture. The limestone is of a dove colour, striped or veined; it has a very fine grain, and is almost compact, which is a sufficient distinction between it and primitive limestone, it is also frequently traversed by very small veins of white calcarious spar. The grey wacke is a very abundant rock in this neighbourhood; it is also fine grained and of a slaty texture. Superincumbent on this, lies a slate varying in colour from green to gray, and passing into talcose and chlorite slate. How far to the northward this transition range extends, following the course of the Hudson, I am not prepared to say; but after having crossed a very high range of hills which run nearly north and south, and proceeding to the eastward on the Boston road for about seven miles towards Pittsfield, the primitive formation again commences, and continues to prevail with little interruption as far as the Penobscot river, which is the utmost extent that has been accurately examined.

SECTION II.

Situation of the Spring,—Temperature, specifick Gravity, and external Qualites.

The situation of the spring at Lebanon is the most agreeable possible; at a considerable elevation on the south side of a hill, commanding a delightful view of the surrounding country, and a most salubrious atmosphere. The water of this spring rises with great rapidity from the crevices of those schistose rocks which I have before described, where a well has been dug about five feet deep and seven or eight feet diameter. The temperature of the water is uniformly, through the whole year, 73° of Fahrenheit. No steam arises from it in the summer, but in the winter it is constantly covered with a dense vapour. Only one spring of this nature has ever been discovered, while the temperature of all others in its neighbourhood are as usual 52; and it is more singular, that a very abundant one of this low temperature exists within twenty yards of the warm spring, and nearly on the same level with it. Here, as in Matlock in Derbyshire, the Tepid spring arises from the centre of the hill, whilst all other wells, both above it and below it, are of the usual low temperature. The supply of water from the thermal spring is so abundant, that it is calculated to

discharge near ten hogsheads in a minute; and advantage has been taken of this and the elevation of the ground, not only to supply all the baths, but to turn two or three mills which are erected within a short distance; which mills, from the temperature of the water, have the advantage of being kept in action during the severity of the winter. A calcarious subtance of a Botryodal and reniform shape is deposited in the rivulet which flows from the spring, which if collected from a place where it has been undisturbed for a considerable time, has much the appearance of a Staligmite or Calc Tufa.

The sensible qualities of the waters of Lebanon are not very peculiar; it is as transparent as crystal when taken from the well, and continues to preserve this transparency after boiling or long standing; it does not sparkle or send out any air bubbles when taken up in a glass; it has no smell; its taste is neither brisk nor acidulous, not unlike pure water, but rather more vapid or insipid. A person who has just visited Ballston will be most particularly struck with the insipidity of this water, as perhaps no two waters differ so much as they do in almost every particular. Having examined the specific gravity of this water with distilled water raised to the same temperature, so little difference appeared, that it was scarsely distinguishable; at the utmost, it was only as 1002 to 1000. An innumerable number of air bubbles are constantly ari-

sing from the crevices of the rock at the bottom of the well; these ascend in a rapid manner through the water with considerable agitation, and seem all to break on the surface, without being absorbed by the water in their passage.

SECTION III.

Examination of the gaseous contents of the Spring.

The first step towards an examination of the gaseous contents of this spring, was, to ascertain what was the nature of that gas, which rises in such abundance with the water, and breaks on its surface. This gas as far as I know, has never yet been examined. It was always supposed to be fixed air or carbonic acid; but the manner in which it arose and broke on the surface, so much more abundant and so different from the gas which arises from the several springs at Ballston or Saratoga, while at the same time the water of this well was totally free from any pungent or acidulous taste, led me to suspect that the greater part of it, at least, was not carbonic acid gas.

In order to ascertain the nature of this gas, I collected a sufficient quantity of it, by means of an inverted funnel, in a bottle graduated by cubic inches. This was immediately plunged into a vessel of fresh lime water, and let remain in it

for some time, frequently agitating the bottle over the lime water; but I found that no diminution of the quantity of gas had taken place, or that no portion of the gas in the bottle had been absorbed. This gas therefore, could not have been carbonic acid, and must have been azote or common air. To determine whether it contained azote, a lighted taper was plunged into the bottle, but it was immediately extinguished. This proves that the greater part of it at least, if not the whole, was azotic gas; it is true, a small quantity of it may have been common air, but it is not probable; however, in order to satisfy myself of this, I made use of the following very simple, but accurate experiment, having no other more convenient eudiometer on the spot. I prepared a solution of hydro-sulphuret of lime, by boiling together sulphur and lime water; and as these substances, when fresh made, have the property of absorbing oxygen when combined with any other gas, I submitted this gas, which had been collected from the surface, to its action for some hours, frequently shaking it in a graduated bottle, but no diminution of its volume even now took place, which would have been the case had it contained atmospherick air.

The next point to ascertain was, whether the water contained any portion of this gas which had passed through it so freely, or whether it was impregnated with carbonic acid gas. For this pur-

pose, I made use of the same instrument which I have described in the analysis of Ballston water, and which I found equally convenient here. This vessel was filled with one quart of water fresh from the well. Heat was applied, and in a short time an extrication of gas took place, but by no means with the same rapidity as in the Ballston water. This was received in a graduated bottle, placed as described over the mouth of the instrument; and when the whole had been collected, and the temperature of the gas reduced to sixty, I found that I had obtained only $10\frac{1}{2}$ cubic inches, this was then passed repeatedly through fresh lime water in a vessel, over which it was let stand for an hour; but I did not perceive that the smallest absorption had taken place, which perfectly satisfied me that this water was totally free from carbonic acid; but if any doubt could remain on the subject, it was decided by future experiments, to be related hereafter.

There could be no suspicion in this case of sulphurated hydrogen gas, which would have been very sensible by its smell. I had, therefore, every reason to believe, that the greater part, if not the whole of those $10\frac{1}{2}$ cubic inches, was azote; and on examination with a lighted taper, I found that this was nearly the case, as the taper was extinguished, but not with the same rapidity as was the case when the gas which was taken from the surface of the well, was submitted to the action of

flame. I had reason, therefore, to suspect that a certain proportion of atmospherick air was combined with it. In order to determine this, I passed it up into a graduated bottle which contained hydro-sulphuret of lime newly made; and after having exposed it to this fluid for some time, I found that it had lost one cubic inch, or that the sulphuret had taken up one cubic inch of oxygen. If, therefore, we recollect that atmospheric air contains nearly one fourth of oxygen and three fourths of azote, we may estimate, that out of $10\frac{1}{2}$ cubic inches which were collected from one quart of water, four cubic inches were atmospheric air, and the remainder $6\frac{1}{2}$ inches were azote.

As the nature of this gas is known to every chemical reader, I shall not intrude by describing it. The only circumstance worth consideration here, is, how this or any other mineral water can absorb such a quantity of this gas, with which we cannot impregnate water in an artificial manner; or from whence, or in what manner, can such a quantity as is here extricated at the surface of the well, be produced. Dr. Garnett attempts to explain the manner in which it is combined with a mineral water, by stating, that as some simple substances, canot be united with water, without being combined with others which assist the solution, so may this gas be rendered soluble by being combined with oxygen or atmospheric air, which we know water will absorb. But this, as he ac-

knowledges himself, is not very satisfactory; for if so, why should we not also at the same time obtain oxygen or atmospheric air in greater quantity? It would, perhaps, be equally futile to attempt an explanation of the means from which such a quantity of azote is extricated. There is, however, one easy method of obtaining azote, which is by means of the decomposition of common or atmospheric air, and one simple process of doing so, is, by exposing it to a mixture of iron filings and sulphur, or iron pyrites in a state of decomposition. Now if we suppose this process to be going on in the bowels of the earth, we may explain the manner in which a quantity of azote may be produced, as also account in some degree for the high temperature of the water, which would take place during this process. But speculations of this kind, unsupported by facts, serve only to amuse the reader. There is, however, something singular in the circumstance, that no carbonic gas could be obtained from this water; in every other instance that I can find, whether in a warm or a cold water, either carbonic acid gas or sulphurated hydrogen, or both, have been found in the same water combined with azote. This, according to Dr. Garnett, is the case at Harrogate, where all those gasses have been found in the same water. In the same manner, according to Dr. Pearson, the water of Buxton, which is one nearly of the same temperature as Lebanon, contains both azote and carbonic acid gas. In none

of them, however, has the same quantity of azote been found as I have described in the waters of Lebanon, which I now state as follows:

One quart, or 57.750 cubic inches, contains,

	Cubic Inches.
Atmospherick air - -	4
Azotick gas - - -	6½
	10½

SECTION IV.

Examination with Tests or Re-agents.

Experiment I.

Litmus Paper is not changed in its colour when dipped into the water. This shows that no acid exists in it, not even carbonic acid gas in a disengaged state; as if it existed in any notable proportion, the colour would be changed to red, which would be fugacious.

Experiment II.

Lime Water, though added to this water in different proportions, was never altered by it. I know of no more accurate test than this of the

presence of carbonic acid gas, if the smallest quantity of it existed, it would be sufficient, when added in proper proportions, to create a cloud in the lime water. This experiment, therefore, fully corroborates the statement which I have already made, of the total absence of carbonic acid gas.

Experiment III.

Paper stained with Turmeric remains perfectly unchanged in colour when let stand in this water, which shows that no alkaline salt exists in it.

Experiment IV.

Prussiat of Potash produces no change whatsoever in the water, nor does *Tincture of Galls*, which shows the total absence of iron.

Experiment V.

Sulphurick Acid. When a few drops of this is poured into a glass of the water, not the smallest change takes place; nor is there any extrication of air bubbles in the glass, which would have been the case had the water contained any alkaline earths, or if carbonic acid, in any form, was present, as is so strikingly the case in the waters of Ballston.

Experiment VI.

Nitrat and Muriat of Barytes produce a white cloud when a few drops are added to a glass of the water, which, on standing for some hours, deposits a light white powder at the bottom of the glass. This shows the presence of a small quantity of sulphurick acid in a state of combination, most probably in the state of a selenite.

Experiment VII.

Nitrat of Silver. When a few drops of this solution are added to a glass of water, a very sensible cloud is produced, and a trifling deposition takes place. This shows the presence of marine acid in a state of combination, but in a very small quantity indeed; not so much as in any common spring in the neighbourhood.

Experiment VIII.

Oxalat of Ammonia, after a short time, produces a white cloud in the water, followed by a deposition of a white powder. This shows the presence of a small quantity of calcarious earth, forming an oxalat of lime; and as the same appearance takes place when added to it after the water has been boiled for some time, it proves

that this lime is in a state of combination, forming an earthy salt; most probably, as we have already dicovered sulphurick acid, it thus forms a selenite.

Experiment IX.

Carbonat of Potash when poured into this water produces a milkiness, and after some time a white flocculent precipitate takes place. This test is an additional proof of the presence of an earthy salt, in small quantity.

Experiment X.

Solution of Soap in Alkohol. A few drops of this poured into a glass of the water, produces a cloud in it. This is caused in the same manner as the former experiment; the alkali of the soap producing a slight decomposition of any earthy salt which is present, and which few waters are free from.

The above tests were sufficiently satisfactory to explain what were the principal substances with which this water was impregnated. They appeared to be nothing more than selenite and some sort of muriat. Experience in such experiments, and in comparing the effects and appearances produced by different tests, had also convinced me,

that even those substances which I had discovered were in very small quantity. To ascertain this, I now proceeded to evaporation, the only true criterion of the exact proportion.

SECTION V.

Examination of the Solid Contents, obtained by Evaporation.

The foregoing experiments with re-agents, having satisfied me that the water of this spring contained but a small quantity of foreign ingredients, I thought it necessary in proceeding to evaporation, to operate on a larger quantity of the fluid than I had done with the waters of Ballston. I accordingly placed two quarts of the water in a porcelain vessel, and commenced evaporation with a gentle heat, which never arose to the boiling point. As soon as the water was heated, minute bubbles of air appeared to collect round the sides of the vessel, but they gradually disappeared, still leaving the water perfectly clear and transparent; no pellicle appeared on its surface at any time, nor did any deposition take place till nearly the whole was evaporated, when a light ash coloured powder began to deposit, and continued to increase till the process was finished, and the powder, dried in a temperature of 160, was then carefully collected and found to weigh only five grains.

These five grains were now digested for several hours in a small quantity of alkohol of as high a specific gravity as 827, filtered, and when dried in the same temperature it was found to have lost in weight only one grain. The few grains which were insoluble in alkohol, were afterwards submitted to the action of about eight times their weight of distilled water, the solution filtered, and the residuum collected on the filter and dried, was found to weigh only two grains and a quarter, so that the water had only taken up one and three quarters.

The first solution in alkohol, which only consisted of one grain, I now examined in the following manner: it was evaporated over a lamp in the bottom of a Florence flask, till a small acrid gelatinous substance was obtained, which was heated to dryness. This was then converted into an aqueous solution, by dissolving it in a small quantity of distilled water; and as it could be only muriat of lime or muriat of magnesia, from the result of former experiments, I examined it for the purpose of ascertaining this. To a part of it I added pure ammonia; but no change took place, which showed it did not contain magnesia. To another part, I added a few drops of oxalat of ammonia, when an immediate precipitate took place, which showed that it was lime only; and having found by nitrat of silver that the acid was the

marine, it was now ascertained that the alkoholic solution was muriat of lime; and that as it had only taken up one grain, the contents of two quarts of water may be stated as follows:

1 grain muriat of lime.

The solution in distilled water was next examined; it was slowly evaporated till an appearance of crystallization took place. From former experiments, the presence of a small quantity both of a muriat and a sulphat, had been ascertained; to determine whether this contained any sulphat, a small quantity of it was dissolved in a few drops of distilled water, to which was added a little muriat of barytes, but no change took place; the remainder was then examined by adding a few drops of sulphuric acid and applying heat, when the strong fumes of muriatic acid, which soon appeared, determined the presence of this acid. In this solution we have therefore discovered marine salt or muriat of soda, consisting of $1\frac{3}{4}$ in two quarts of the water.

The residuum, which had resisted the action both of alkohol and distilled water, and which amounted to $2\frac{1}{4}$, remained now to be examined. It has been already shown, that this water contained both lime and sulphuric acid in a state of combination, there was, therefore, every reason to

presume, that this residuum consisted of one or both of these substances. In order to take up the sulphat of lime, I boiled the residuum for half an hour in something more than 500 times its weight of distilled water, filtered and dried what still continued insoluble, when I found it reduced in weight to $\frac{3}{4}$ of a grain. That which had been taken up by the boiling water, was therefore undoubtedly sulphat of lime: and as it amounted to $1\frac{1}{2}$ grains, we may conclude that two quarts of the water of Lebanon spring contains $1\frac{1}{2}$ of sulphat of lime.

The residuum which now remained, consisted only of $\frac{3}{4}$ of a grain; on this was poured a little diluted muriatic acid, when the whole was immediately dissolved with a slight effervescence; and the solution, when examined with oxalat of ammonia, showed the presence of lime.

The whole of the analysis for all useful purposes was now completed, and the result I shall state as follows:

Two quarts of the water of Lebanon spring contain,

	Grains.
Muriat of lime - -	1
Muriat of soda - -	$1\frac{3}{4}$

Sulphat of lime - -	$1\frac{1}{2}$
Carbonat of lime - -	$\frac{3}{4}$
Total,	5

Of aeriform fluids in two quarts of water:

	Cubic Inches.
Azotic gas - -	13
Atmospheric air - -	8
	21

Before I proceed to give my opinion upon the medicinal qualities of this water, it may not be uninteresting to make a few observations on the comparative contents and general circumstances of such thermal waters as we are best acquainted with. We have several examples, particularly in England, of waters so extremely similar, in temperature and chemical qualities, to the waters of Lebanon, that scarcely any difference can be traced between them by the most accurate analysis. Those are the waters of Buxton, Bristol, and Matlock, in England; and of Mallow, in the south of Ireland. The highest temperature of any of them is that of Buxton, which is 82°, the lowest, which is that of Matlock, is 66; so that in temperature they nearly agree. Bristol, which is one of the most celebrated of these waters, stands at 74°, Lebanon at 73.

The contents of all these waters are nearly the same, viz. a small quantity of muriat of soda, sulphat of lime, and carbonat of lime. Buxton water has been found also to contain azotic gas, and I strongly suspect that all the rest equally do so. I am confident that Matlock water does, as I have observed the gas ascending from the well in the same manner, and ascertained it to be azote.

In another respect there is a very striking coincidence, which is, that in all those places the water rises in great abundance, and from rocks of the same transition formation as at Lebanon.

SECTION VI.

Observations on the internal and external use of the Waters of Lebanon.

The inferences which will naturally be drawn from the above analysis will lead us to conclude, that the waters of Lebanon spring are of an extremely pure nature, perhaps as much so as any waters flowing from the bowels of the earth which have been as yet examined. Scarcely any common spring water is so free from foreign matter as this; its sensible and physical properties differ also but little from good common water. We must, therefore, in treating of its medicinal virtues, attribute whatever it posesses principally to temperature, independant of those qualities which so very pure a water may be supposed to possess when taken into the system in any quantity; and though, as I have already stated, I am not inclined to attribute to mineral waters of any description any very exclusive properties which cannot be shown by chemical analysis, yet I am not willing to extend this opinion so far as not to acknowledge, that such waters as Lebanon, possessing a

high temperature, and but few foreign or active ingredients, may in certain cases afford great benefit to the invalid. We cannot altogether reject the opinion of the best medical writers on this subject, nor the experience of those who have received great relief from the use of such waters.

In treating of the medicinal qualities of the Lebanon water, and judging from its analogy to those of Bristol in England, no doubt can arise of its possessing equal virtues. Bristol has been celebrated for centuries, for the cure of consumption; and perhaps there is no watering place in any country which is so much frequented.

That many persons with a predisposition to this complaint have been effectually relieved, and that others actually labouring under it have had many of the symtoms alleviated, I shall not pretend to deny; but that any person with a confirmed phthisis has ever been cured by the use of it, has never been satisfactorily proved. This is a disease which, even more than the gout, has always been the opprobrium medicinæ. When once it has got firm

hold, the physician can do little more than relieve the urgent symptoms. With this intention, many of those are sent to such watering places as Bristol or Lebanon, and where medicine will often bring no relief, such waters, though not a cure for consumption, alleviate some of the most harrassing symtoms in this complaint. It is, as Dr. Saunders observes, "particularly efficacious in moderating the thirst, the dry burning heat of the hands and feet, the partial night sweats, and the symtoms that are peculiarly hectical." All these benefits arise principally from the extreme purity of the water as well as its temperature, rendering the use of it in considerable quantity perfectly safe as a mild diluent. Something also may be attributed to change of air and climate, as no part of this country enjoys a more temperate or salubrious atmosphere than Lebanon in the summer; nor is there any place where the advantage of exercise can be more freely enjoyed.

After having spoken of the use of Ballston water in the cure of dyspepsia, and highly recommended it as a most valuable remedy in the most

obstinate cases,* it may be thought singular that I should venture an opinion on the use of so different a water as Lebanon, in a disease of this nature; but those who are acquainted with the variety of causes which give rise to this complaint, and the variety of anomalous symptoms which attend it, will not be surprised at this apparent contradiction. That my opinions on this subject are not the effect of prejudice, but arise from well founded observations on the treatment of this complaint, I shall take the liberty here of quoting the words of Dr. Saunders on the use of water as a medicine: he observes as follows.

'Another, and more decidedly beneficial use of water as a medicine, is in relieving those deranged functions of the stomach and bowels, and biliary organs, occasioned by the most frequent of all causes of disease, (especially with men of a middle age, and in easy circumstances) a long and habitual indulgence in high food, strong drink,

* For more particular information on this subject, I must refer the reader to my Treatise on the Chymical properties and Medicinal qualities of the waters of Ballston and Saratoga. Page 134.

W. M.

and all the luxuries of the table. In such cases there are three direct causes of disease, which operate at once in producing the morbid changes; they are, too large a quantity of food for the wants of the body, too great a proportion of solid to fluid aliment, and all the ingesta of too stimulating a kind.

The stomach, being here in a constant state of high excitement and over-distention, becomes gradually debilitated, and unable to perform duly the office of digestion; hence arise heart-burn, flatulence, and sour eructations, the effect of spontaneous changes produced in the mass of food when not entirely checked by the digestive process; hence too great irregularity in the secretion of bile, either on the one hand highly acrid, so as to increase the morbid stimulus on the stomach by regurgitation into that cavity, or else scantily supplied, and therefore unable to complete the separation of chyle, and producing obstinate costiveness from the absence of the necessary and healthy stimulus on the intestines. At length too, comes on an alarming defect of nervous energy, and a dangerous determination to the head,

and palsy or apoplexy often compleat the derangement of the animal frame.

With all, or any of these symtoms to combat, it must suggest itself to a prudent physician, that next to relieving such of them as are very urgent, it becomes of the highest importance to endeavour to come at the fountain head of these disorders, and to restore the healthy function of the stomach, that organ, the diseased state of which had been the cause of all this mischief. To fulfil this intention, which can only be done very gradually, no general plan of cure seems to be so strongly indicated, as a constant and habitual addition of a considerable quantity of water in divided doses to the daily ingesta. This simple remedy will of itself remove the defect of an over proportion of solid aliment, will render every kind of food less stimulating, lessen the irritation in the primæ viæ, dilute the bile when acrid, moderate its stimulus on the bowels, and render the discharge of the excrementitious part of the food more regular and easy. This I am convinced is the true source of *part* of the relief given in dyspeptic complaints, by all our most celebrated mineral waters; and of *the whole*, in several waters

of high reputation (allowing for the circumstance of temperature). I am far from asserting however, that mere aqueous dilution is of itself equal to restore the healthy functions of those digesting organs that have been deranged by a long continuance in the habits which produce dyspepsia. Every practitioner is acquainted with those valuable and more active remedies, which it is necessary to use in such cases but these it is not my intention to enlarge upon.

In the use of water as a medicine in chronic as well as acute diseases, regard is also to be had to the circumstance of temperature.—The simple diluent effect will be perhaps the most powerful at a temperature approaching to the animal heat, or nearly that of Bristol water; it is however, less grateful at this degree than that of 45° to 60, the usual heat of our ordinary springs. The common idea of the debilitating effect of tepid water, seems to be but ill founded, except we go to a height of temperature much above that of the animal body. The tepid waters of Bristol or Bath are never observed to produce any weakening effect on the stomach, but, on the contrary, the ap-

petite and general health are improved under the use of them; and it does not appear that in any of the thermal mineral springs that we are in the habit of using medicinally, their high temperature counteracts the invigorating qualities of their foreign ingredients. Delicate and very irritable stomachs often require a tepid warmth to be given to their drink; for the process of digestion may in these habits be suddenly disturbed by a draught of cold water, and sickness may immediately follow. Warm water has often a remarkable effect, in abating that distressing and gnawing pain, arising from acrimony in the undigested food, commonly known by the term, heart-burn. A draught of water, taken as warm as it can be drank, will often give very sudden relief in this complaint.(*a*)

In those cases of dyspepsia therefore which are but slight, where there is no organic affection of the viscera, where there is only a defective digestion and derangement of the alimentary organs, arising from a life of high indulgence; the use of Leba-

(*a*) For further particulars on the treatment of dyspepsia arising from a diseased liver, and on the use of the aqueous regimen, see Dr. Saunders' treatise on the structure, economy, and diseases of the Liver. 3d. edition.

non water alone, persevered in for some time, will give considerable relief; but more particularly if those dyspeptic symptoms have any connexion with a gouty habit and proceed from retrocession; in such case, this water is much more safe and salutary than either the Ballston or Saratoga water. Besides this, the greatest advantage may be received from the use of it as a bath at its natural temperature; but if necessary, this temperature may be raised; and from such a bath as this alone, such patients cannot fail of finding relief.

The immediate effects of these waters on the system are so little sensible, that it is not surprising that they should be considered by many as purely inert. It often happens, however, that where the stomach is foul and loaded with bilious or acrid matter, this water often purges pretty freely at first; but this operation ceases when the intestines are restored to their natural state. The most common effect of this water is a diuretic; from this many who have been affected with complaints of the bladder and kidneys, have received benefit. It may be drank in considerable quantity without any inconvenience, particularly if it passes off freely by the kidneys, in which case it

relieves many of those painful symptoms which attend what are called attacks of the gravel.

Hard and impure waters, have always been considered as tending to produce calculous complaints, and have therefore been strictly forbidden to persons labouring under these disorders, as it is observed, that in many instances they increase the painful symptoms of this most distressing complaint; soft waters have a certain advantage over the hard, in possessing greater powers of solution over animal, vegetable and saline matter. This circumstance, says Dr. Saunders, appears to go a good way in explaining the great benefit produced in calculous complaints, by a water like that of Malvern in England, which is so perfectly pure that it scarcely contains a notable proportion of salt of any kind.

Those who are much affected with the gout, are frequently subject to nephritic complaints; in such cases such a water as this is much safer, and more efficacious than any chalybeate or cold saline water; indeed no judicious physician would venture to prescribe waters of such a nature in any stage of the gout. Such waters as Buxton or

Bath derive their principal credit from the relief which persons labouring under retrocedent gout receive from them ; and although the temperature of Lebanon spring is not quite so high as that of Buxton, yet it comes nearer to it than any other ; and the experience of many invalids have confirmed the opinion of its useful qualities ; and yet, notwithstanding what I have said, I should consider myself as in some degree deceiving my readers, if I was understood as stating this water to be possessed of any strong powers on the system. Reason as well as analysis, will show at once that this cannot be the case. How different indeed is it in every respect from the waters of Ballston and Saratoga, which are so powerful, that much of the physician's business is to prevent the abuse of them, while the waters of Lebanon may be drank with freedom without any apprehension.

It will probably here be expected, that I should take some notice of the proper period for commencing a course of this water, the manner of drinking it, and the diet and regimen to be pursued during the use of it.

With respect to the season for visiting Lebanon,

some prudence is certainly necessary; from its Northern latitude, the Winters are consequently severe,and of course it is an unfit place for an invalid at that season, though the water itself preserves the same qualities and temperature ; the springs are also late, and it is not till late in the month of May that the climate becomes perfectly agreeable; the Summer season is therefore the limited period for the use of this water; but (for what reason I know not) neither this place, or Ballston, are generally frequented till late in the month of July, which renders the stay of invalids too short at either of those places, to obtain that permanent benefit which may be expected, either from a change of climate, or a course of any mineral water ; the heavy dews, cold nights, and equinoctial gales which commence early in the Autumn, soon remind visitors of the necesssity of preparing to return to a more congenial climate, and thus the early part of the Summer is neglected, when this part of the country offers so many inducements to their Southern neighbours.

With respect to the mode of drinking the waters of Lebanon, much more latitude may be taken than at most other springs, few persons find

it so very agreeable as to drink more of it than is prudent; it has too warm a temperature to be very grateful in the summer, and it has none of that acidulous, pungent and stimulating quality which renders the Ballston and Saratoga waters so agreeable to those who are accustomed to them. On this subject therefore few cautions are necessary, two or three glasses taken twice in the day will be fully sufficient, more would only distend and relax the stomach, impair digestion, and aggravate those complaints which it was perhaps intended to remove.

As to diet, there are few temptations here to any excess or irregularity; a proper combination of wholesome animal as well as vegetable food, is always considered most conducive to health, and those who visit Lebanon, will have no reason to complain of a deficiency of any article of this kind;—moderation in the use of them, and temperance at meals, is what the invalid should principally attend to.

Whatever I have now to say on this subject, shall be principally confined to the use of this

water as a bath in certain diseases. The ancients esteemed warm bathing not only as a remedy in disease, but as one of their greatest luxuries: with many in this country, it is not so much used as a wholesome, and even a necessary luxury, as it is made use of by the advice of a physician, for the cure of particular diseases.

It is, however, better understood in Europe; and in many parts of it, particularly the south, is still considered so conducive to health, that their baths are constructed in a superb manner, and with as much attention to convenience and luxury, as any of the edifices which they inhabit.

The use of the warm bath, is now considered very justly as indispensible in warm climates. It has long been common in the French West India Islands; and their exemption from disease when compared with the British, is probably in some measure to be attributed to the frequent custom of warm bathing. So far from its producing relaxation or debility, as many suppose, it was formerly considered as the solace of toil, and resorted to with a view to renovate vigour exhausted by exertion. I have, when treating of

the waters of Balston, made some remarks on the use of warm bathing in diseases of the skin, much fewer cases of which should we meet with if more attention was shown to strict cleanliness of person, or if that matter which is thrown out by the exhalents, and suffered to accumulate on the surface of the body, was more frequently removed by the use of the warm bath.

With regard to the use of the waters of Lebanon externally, I cannot consider them as any more than a bath of very pure water, and of a very agreeable and steady temperature, scarcely capable of doing mischief in any complaint, and in some cases, of a sufficient temperature to be useful; but wherever the highest temperature (and such I consider should seldom exceed 98°) becomes necessary, it can be obtained here in as comfortable a manner as at any other watering place in this country, with the advantage of a plentiful supply of the same water.

As the natural temperature of the water is only from 73 to 74, it may be considered rather as a low state of a tepid bath. A slight shock is felt

on first immersion, yet much of this depends on the relative heat of the body at the time; but this is almost immediately succeeded by a highly pleasurable glow over the whole body, which persons describe as if the skin was anointed with some soft substance with which the water was impregnated, but which entirely arises from its purity, combined with moisture and temperature. On account of the slight effect of the shock, persons of a very delicate constitution can bear it without any disagreeable effect, as less re-action of the system is required to overcome it. From this circumstance it is easy to explain, why females labouring under amenorrhœa or suppression of the menses, find so much advantage from the use of this bath; such persons generally are affected with such symptoms of general debility, as would render the use of a cold bath highly improper, while at the same time, so much feverish irritation accompanies the complaint, that the use of one of a very high temperature would be equally injudicious. I can therefore easily give credit to the opinion of those physicians of experience who reside in the neighbourhood, and who highly extol the use of this water in complaints of this nature. By a steady use of this bath at its natural tempera-

ture the general health will be improved, and much of that languor of circulation which constitutes the principal feature of this distressing disorder, will be removed.

Such being the effect of this water, it will not be difficult to understand in what diseases it may be used externally with advantage. The greater number of cases which are most relieved by the use of this natural bath, are those in which particular parts of the body have suffered a loss of sensation or action, or where a certain degree of rigidity has seized any of the joints or limbs. When this arises from rheumatism of the chronic kind, after the inflammatory action is over, much relief may be expected from the use of this bath, even without additional heat. It may be remarked also, that it has one advantage, which is, that from the size of the bath and the quantity of the water, the patient may make use of any posture, or even move about during the use of it, a circumstance of no small advantage.

There are very few instances, where invalids just recovering from the effects of long confinement from rheumatic attacks, can venture at once to plunge into a cold bath, however advisable it may

afterwards be. The temperature of the Lebanon bath is in these cases a most admirable preparation for cold or sea bathing, as when a certain degree of healthy action is restored, a colder water may then be used with greater advantage. There are also cases of gout where this bath may be used in its natural state, but in general it will be much safer to begin with it heated to a higher temperature. The true paralysis also requires a bath of a much more decided stimulus of heat, than this water in its natural state.

In chorea sancti viti, considerable benefit may be received from the external use of this bath; and in many cases of cramps or spasms of any particular limb, experience has shown the good effects of it. Few cases have come within my own particular observation while there, but I cannot entirely discredit the accounts which I have received, of very singular cures which have been performed, by the external use of this tepid water, in complaints of this nature.

The waters of Lebanon have been long used as a remedy in all herpetic eruptions, particularly those which are vulgarly called here *salt*

rheum; for myself, I confess that I do not perfectly comprehend under what class of herpes this complaint should be placed; it appears to me that every eruption, whether in the form of an open ulcer or a scaly one, goes under this appellation; in both cases however, experience has shown the good effect which may be expected from the external use of a water of such purity and temperature: the waters of Malvern in England, which are only remarkable for their purity, derive their principal reputation from their efficacy in painful deep seated ulcerations, the consequence of a scrophulous habit of body; there it is kept constantly applied to the sore, and it is always found to moderate the discharge and correct the fœtor which usually attends it, till a salutary change takes place, and even these obstinate cases of desquamation that are frequently produced by a sudden exposure to cold, are often cured by this remedy; where the skin is hot and dry, it remarkably relieves the intolerable itching of herpetic disorders, and renders the surface of the body more cool and perspirable; it is however principally as a bath that any great reliance should be placed on the waters of Lebanon

in all complaints of the skin, though at the same time there may be cases where the internal use of it may be found serviceable; these instances are, where the disease has arisen from a life of high indulgence, in which the use of this water as a diluent, may be necessary, while great attention is paid to regularity of diet.

It would be only repeating much of what I have already said on cutaneous complaints, when treating of the waters of Ballston, was I to enter into the particular nature of warm bathing in all herpetic eruptions; but as I consider the principal advantage of it to arise from moisture and temperature, more than any peculiar substance which the water contains, (except, perhaps, in the single instance of a sulphurous impregnation,) I am inclined to the opinion, that in almost all complaints of the skin, the purer the water, the more effectual the bath. If this is the case, the water of Lebanon as an external remedy, is at least as effectual as any other of the same temperature, whether natural or artificial; and it cannot be denied, that a bath of such purity is more agreeable and luxurious, than one which holds in solution a variety of extraneous substances.

With respect to the time of making use of this bath, it must be principally regulated by the effect which is intended to be produced. If the temperature is to be raised for the purpose of producing a diaphoresis, the best time is certainly late in the evening; but in no case should it be used after a full meal; and if it is used of the natural heat, the best time is certainly about an hour or two before dinner; seldom remaining in it more than ten minutes, and using a little gentle exercise after coming out of it.

CONTENTS.